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31. DUNG AND DUNG BEETLES IN KANHA TIGER RESERVE, CENTRAL INDIAN HIGHLANDS

During zoological fieldwork in Kanha Tiger Reserve, Mandla District, Madhya Pradesh, dung beetles were collected from the faeces of a variety of mammals. As data on dung beetles in Kanha have not been previously published the results are presented here.

Kanha Tiger Reserve is a 1945 km^2 tract of dry deciduous, moist deciduous (sal, *Shorea robusta*) forest and anthropogenic meadow in the Maikal Hills (Schaller 1967, Newton 1984, 1985). It holds abundant large mammals including tiger (*Panthera tigris*) and ten species of ungulate. Dung beetles were collected (1980-1982) from dung deposited on and around the central Kanha maidan (80° 38′ 3″ E, 22° 17′ 15″ N, 600 m above m.s.l.) immediately east of Kanha Forest Village in sal forest and meadow. The identity of the dung was determined by PNN and Mungal Baiga, and the beetles by Mr. L. Jessop of the British Museum (Natural History), London.

The species of coprophagous beetle collected and the identity of the mammal responsible for the dung are listed in Table 1. All beetles belong to the subfamily Scarabaeinae. In addition, an *Anomala* species (Rutelinae) was collected from elephant dung (*Elephas maximus*). A total of 22 species of Scarabaeinae were collected with one species of *Garreta* (near *G. smaragdifer* Walker) apparently undescribed (Jessop, pers. comm.). Of the 29 collections of the large genus *Onthophagus*, *O. griseosetosus* could be identified, while the remaining specimens were sorted into nine "Recognizable Taxonomic Units" which are probably separate species.

Dung beetles were collected in February, March and May to August with the peak in frequency of collection in the monsoon months of June and July. With the exception of two species collected from chital (*Cervus axis*) rumen contents at a dhole (*Cuon alpinus*) kill, the few beetles collected outside the monsoon were at elephant faeces. The apparent specialization on elephant dung and rumen contents by beetles foraging outside the

monsoon may reflect the large size, softness and presence of a persistent humid core in both these resources.

Kingston (1977), in a study of the coprophagous beetle fauna of elephant (*Loxodonta africana*) dung in Kenya, also found very few beetles outside the wet season. The fauna was richer (126 species collected in 2 years) than that collected in Kanha, although comparison is complicated by the considerably greater effort expended in the Kenyan study. Coe (1979) collected 21 species of Scarabaeinae from cow dung in 7 days in south India with 2 species (*C. repertus* & *G. cyaneus*) common to this study.

Most studies of dung beetles have examined their relationship with the dung of one mammal species, such as the cow (Hanski & Koskela 1977, Coe 1979) or elephant (Kingston 1977). Few investigations have examined the selection of dung of various mammal species by different coprophagous beetles. Eight of the 22 species collected were only found on one "species" of dung (Table 1). *Onthophagus griseosetosus* was found at the greatest number of dung "species" (5), but the remaining members of the genus were confined to elephant and wild pig (*Sus scrofa*) dung. Most other species did not colonise elephant dung but exploited chital and langur (*Presbytis entellus*) faeces, with occasional records on blackbuck (*Antilope cervicapra*), elephant, jackal (*Canis aureus*), dhole and human faeces. K. K. Gurung collected dung beetles from tiger, Indian elephant and Indian rhinoceros (*Rhinoceros unicornis*) in the Royal Chitwan National Park, Nepal (material in BM (NH), pers. comm. L. Jessop). Three species were common to this collection. *Paragymnopleurus sinuatus* & *Zizyphus crispatus* were found on rhinoceros dung while *Catharsius molossus* was found on elephant faeces. Of the 30 species collected, 18 belonged to the genus *Onthophagus*.

TABLE 1

NUMBER OF OCCURRENCES OF DUNG BEETLES AT 56 FAECES OF 8 MAMMAL SPECIES IN KANHA TIGER RESERVE

Scarabaeinae beetle species	Mammal Species (responsible for dung)									
	Chital	Blackbuck	Pig	Elephant	Jackal	Dhole	Langur	Human	N	n
Catharsius molossus L.							1		1	1
C. pithecius Fabricius	1	2			1		1		5	4
Onitis subopacus Arrow	1+								1	1
Copris ?davisoni Waterhouse	1+								1	1
C. carinicus Gillet							1		1	1
C. repertus Walk.									*1	0
Gymnopleurus cyaneus Fabricius	1	1					1		3	3
Paragymnopleurus sinuatus Olivier							3		3	1
Garreta mundus Wiedmann	1								1	1
Garreta sp. [undescribed]							3		3	1
Zizyphus crispatus Gory	3			1		1	3		8	4
Proagoderus pactolus Fabricius							1	1	2	2
Phalops olivaceus Lansberge	1								1	1
Onthophagus griseosetosus Arrow	2	1		3	1		5		12	5
Onthophagus: nine species			3	14					17	2

+ = collected from rumen contents.
* = collected at night while flying into light.
N = number of collections in which species identified.
n = number of mammal species' dung at which beetle species recorded.
For mammals, latin names see text.

Euryphagy was the predominant pattern in Kanha with few stenophagous species. A similar pattern was reported by Halffter & Mathews (1966) for tropical Africa. Although the sample sizes are small, two Kanha species, *P. sinuatus* & *Garreta* (undescribed) appeared to be confined to langur dung. Similarly, Struhsaker (1975) suggested that, in Uganda, the beetle *Gymnopleurus crenulatus* is associated with red colobus (*Colobus badius*) dung. Factors involved in dung selection may include fibre size and concentration (e.g. in elephant faeces) and chemical composition. However, there is no clear distinction between beetles utilizing herbivore and carnivore dung in Kanha.

The interpretation of these results is complicated by collector bias. The large number of beetles collected from langur dung relative to other mammals probably reflects the fact that langurs were being intensively studied. Similarly, the collection of only one species of Scarabaeinae from dhole dung probably reflects the rarity with which dung positively attributable to this species, as opposed to jackals, was identified. The three mammals which supported the greatest species richness of dung beetles — chital, elephant and langur produced the most visible and abundant dung. Additional confounding factors include the possible under-representation of nocturnal beetles (Coe 1979) and beetles which visited dung briefly and rolled balls of faeces away (Kingston 1977), in comparison to diurnal beetles and those which remained within dung. The lack of data on the number of individuals of each species at each dung deposit limits the usefulness of the collection. If 'switching' (Kingston 1977) occurred, with beetles becoming more specialist with the onset of breeding, the pattern illustrated in Table 1 will depend on the reproductive state of the beetles during the collection periods.

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